SB761
U7R6
#84-2

FOREST PEST MANAGEMENT

3430 BIOLOGICAL EVALUATION
R2-84-2

JACK PINE DECLINE

NEBRASKA NATIONAL FOREST

MAY 1984

United States
Department of
Agriculture

Forest Service

Forest Pest Management
Denver, Colorado

3430 BIOLOGICAL EVALUATION
R2-84-2

JACK PINE DECLINE

NEBRASKA NATIONAL FOREST

MAY 1984

PREPARED BY: E. Mike Sharon

E. Mike Sharon
Plant Pathologist

APPROVED BY: James R. Beavers

JAMES R. BEAVERS
Director, Timber, Forest Pest, and
Cooperative Forestry Management

Timber, Forest Pest, and
Cooperative Forestry Management
11177 W. 8th Avenue
P. O. Box 25127
Lakewood, CO 80225

LIBRARY
APR 04 1985
ROCKY MOUNTAIN STATION

ABSTRACT

In 1978 an investigation was initiated to determine the etiology, extent and distribution of jack pine decline in plantations within the Nebraska National Forest. Data from ground transect and variable plot surveys in 1978 indicated that approximately 16 percent of the sampled trees were dead or declining. Subsequent surveys of eight semi-permanent plots examined in 1980, 1982 and 1983 indicate mortality has decreased significantly. It appears jack pine decline has "petered out" in the areas monitored.

ACKNOWLEDGEMENTS

The author acknowledges the assistance of the following members of the R-2 Forest Pest Management Staff during various aspects of this investigation: R. L. Fuller, D. M. Hildebrand, C. G. O'Neil, and B. J. Raimo.

INTRODUCTION

The Nebraska National Forest is one of the largest man-made forests in the world. Planting was initiated in 1903 and continued for 38 years. A total of 31,000 acres were successfully planted to various coniferous species. Some jack pine stands displayed effects from competition within the first decade after planting primarily because trees were planted closely. A two year drought in the early 1920's resulting in "natural mortality" thinned out many of the stands. Although "natural mortality" continued to thin the stands for several decades, most of the jack pine plantations remained intact until May 1965, when many were destroyed by fire. After the fire, an outbreak of pine engraver (*Ips* spp.) occurred in residual stands. The outbreak was controlled by chemical applications of lindane to infested trees.

Fomes annosus (Fr.) Cke. root disease was found in two areas of thinned jack pine before the 1965 fire (Stewart 1965). These areas were destroyed in the fire. *F. annosus* was again discovered in 1982 (Fuller).

In 1978 outbreaks of jack pine budworm, *Choristoneura pinus* Freeman, were observed. An extensive survey of defoliated trees was made in 1979. A year later a control project was undertaken (Hostetler 1981).

Concurrent with the pine budworm outbreaks, was a decline and mortality of jack pines not infested by pine budworm. In the decline areas, over 16% of 5017 trees surveyed on 285 acres were dead or in some stage of decline in 1978 (James 1979). Secondary insects including, *Ips calligraphus* and *Dendroctonus valens* were found along with a fungus, *Ceratocystis minor*. The purpose of this report is to update the status of the decline since 1978.

MATERIALS AND METHODS

SURVEY - Eight semi-permanent plots (one per stand) were established in 1978 to monitor decline symptom expression and mortality. Plot size was delineated by patterns of decline symptomatology. At least one row of green trees beyond those showing symptoms was included in each plot. All plots were referenced to the plot center (usually a tree) by azimuth and distance and identified with a numbered metal tag on the bole. Each tree was measured (dbh, height), and rated for current symptom expression. Biennial inspections were made to update decline symptom development.[1/]

1/ A final survey was made in 1983 for comparison because of the data gaps for two plots in 1980. We had several changes of personnel between 1978 and 1983 and two plots could not be found in 1980.

RESULTS

Although the pattern of symptoms were typical of those caused by root disease, with dead trees in the center of a pocket surrounded by trees at various stages of decline, a root pathogen was never found. In 1983, the last examination of spread plots, no previously healthy trees showed symptoms of decline. Only four trees with chlorotic symptoms noted in 1982 declined in 1983. There was only one tree showing decline symptoms in 1983. Based on observations of trees in plots established in 1978, it appears the jack pine decline has "petered out". The etiology of the decline and mortality remains unknown.

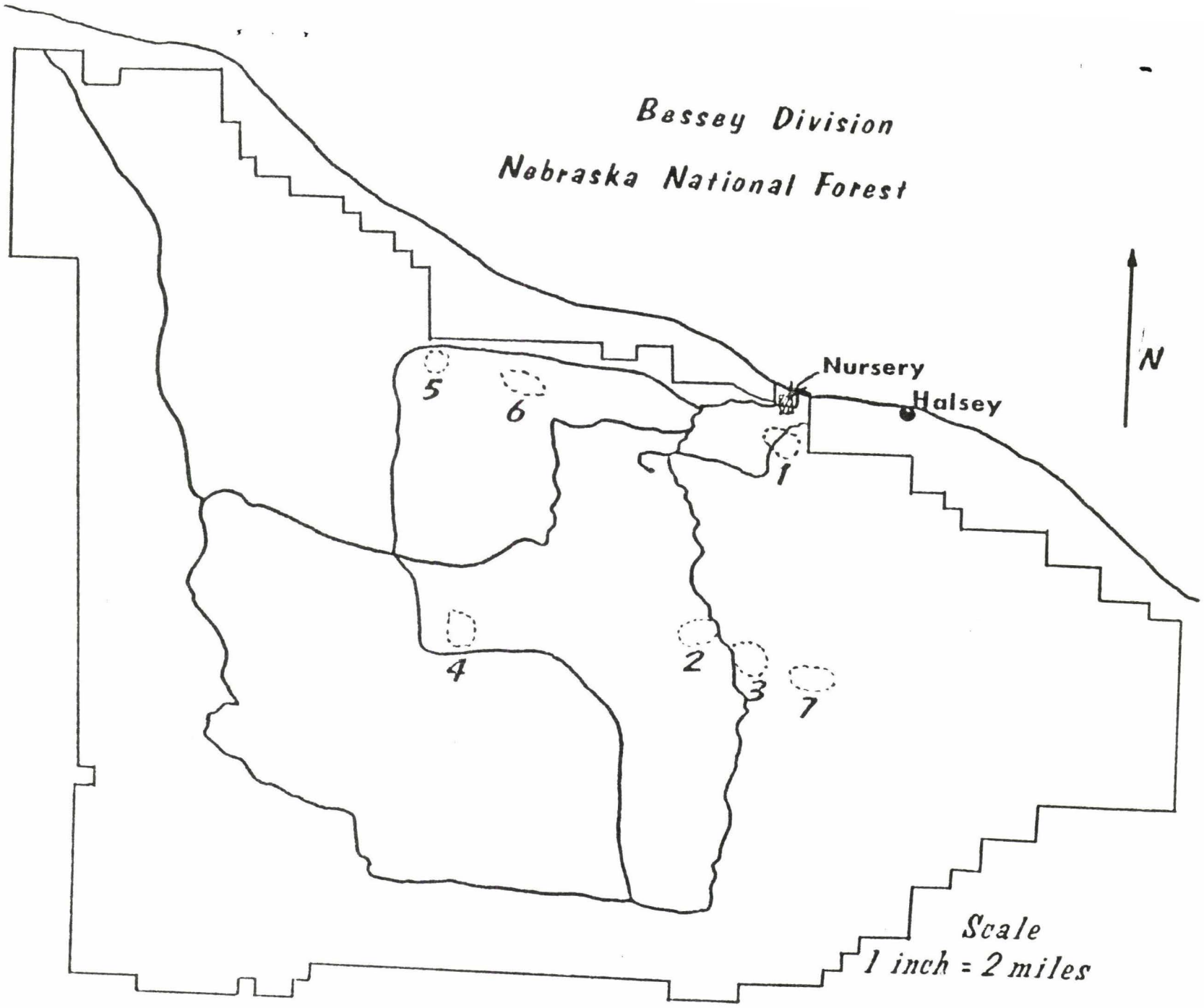

Figure 1. Locations of seven jack pine plantations within the Bessey Division, Nebraska National Forest where decline was surveyed and monitoring plots were established.

Table 1. Numbers of jack pine rated by symptom categories and year.

Plot	Total Trees Sampled	1978				1980					1982					1983				
		D	DI	C	H	D	DI	C	(NS)	H	D	DI	C	(NS)	H	D	DI	C	(NS)	H
1B	52	9	5	1	37	17	0	5	(7)	30	18	0	1	(0)	33[1/]	18	0	1	(0)	33
2B	52	9	5	0	38	14	1	0	(1)	37	18[2/]	0	1	(4)	33	18	0	0	(0)	34[1]
3B	26	2	1	1	22	3	0	0	(0)	23[3/]	4	0	0	(0)	22	4	0	0	(0)	22
4B	30	3	1	1	25	5	0	0	(0)	25	5	0	0	(0)	25	5	0	0	(0)	25
5B	52	9	1	0	42	11	0	0	(1)	41	12	0	1	(2)	39	12	0	0	(0)	40[4/]
6B	26	8	1	0	17	*plot not visited*					10	0	2	(2)	14	12[1/]	0	0	(0)	14
7B	34	3	2	0	29	6	0	0	(0)	28	6	0	2	(2)	26	8	0	0	(0)	26
1M	41	12	1	1	27	*plot not visited*					20[6/]	0	0	(0)	21	20	0	0	(0)	21
	313	55	17	4	237						93	0	7	(10)	213	97	0	0	(0)	215

1/ Three trees rated as chlorotic in 1980 were green in 1982 and 1983.

2/ One previously healthy tree was missing. It was removed by wood cutters and assumed dead when cut.

3/ One previously chlorotic tree classified as healthy in 1980.

4/ One previously chlorotic tree classified as healthy in 1984.

5/ Includes previously classified chlorotic trees.

6/ Includes four sample trees removed by wood cutters: in 1978 one was dead, one chlorotic and two green.

(NS) Non-additive. Trees that had no previous symptoms but now are C, DI or D.

D = Dead; DI = Declining; C = Chlorotic; H = Healthy

Table 2. Percent of jack pine rated by symptoms and year.

Plot	Total Sample	1978 D	1978 DI	1978 C	1978 H	1980 D	1980 DI	1980 C	1980 (NS)	1980 H	1982 D	1982 DI	1982 C	1982 (NS)	1982 H	1983 D	1983 DI	1983 C	1983 (NS)	1983 H
1B	52	17	10	2	71	33	0	10	(13)	58	35	0	2	(0)	63[1/]	35	0	2	(0)	63
2B	52	17	10	0	73	27	2	0	(2)	71	35[2/]	0	2	(10)	63	35	0	0	(0)	65[4]
3B	26	8	4	4	85	12	0	0	(0)	88[3/]	15	0	0	(0)	85	15	0	0	(0)	85
4B	30	10	3	3	83	17	0	0	(0)	83	17	0	0	(0)	83	17	0	0	(0)	83
5B	52	17	2	0	81	21	0	0	(2)	79	23	0	2	(4)	75	23	0	0	(0)	77[4/]
6B	26	31	4	0	65	*plot not visited*					38	0	8	(8)	54	46[1/]	0	0	(0)	65
7B	34	9	6	0	85	18	0	0	(0)	82	18	0	6	(6)	76	24	0	0	(0)	76
1M	41	29	2	2	66	*plot not visited*					49[6/]	0	0	(0)	51	49	0	0	(0)	51

1/ Three trees rated as chlorotic in 1980 were green in 1982 and 1983.

2/ One previously healthly tree was missing. It was removed by wood cutters and assumed dead when cut.

3/ One previously chlorotic tree classified as healthy in 1980.

4/ One previously chlorotic tree classified as healthy in 1984.

5/ Includes previously classified chlorotic trees.

6/ Includes four sample trees removed by wood cutters: in 1978 one was dead, one chlorotic and two green.

(NS) Non-additive. Tree that had no previous symptoms but now are C, DI or D.

D = Dead; DI = Declining; C = Chlorotic; H = Healthy

Table 3. Jack pine mortality following plot establishment

Plot	No. trees showing YE or BR symptoms				No. trees with symptoms YE or BR in previous year that are dead in subsequent years			No. trees that were healthy in previous year that are dead in subsequent years		
	78	80	82	83	80	82	83	80	82	83
1B	6	5	1	1	5	1	0	3	0	0
2B	5	1	1	0	5	1	0	0	2	0
3B	2	0	0	0	0	0	0	0	0	0
4B	2	0	-	0	2	-	0	0	-	0
5B	1	0	1	0	1	0	0	1	0	1
6B	1	-	2	0	-	0	1	-	0	0
7B	2	0	2	0	2	0	2	0	0	0
1M	2	-	0	0	-	0	0	-	0	0
Totals	21	6	7	1	15	2	3	4	2	1

YE = Yellow
Br = Brown

REFERENCES

Fuller, R. L. 1982. *Fomes annosus* root rot on Bessey Ranger District. USDA For. Serv., Rocky Mt. Region, Service Trip Appraisal Report #82-13, December 3, 1982, 2 p.

Hostetler, B. B. 1981. Suppression of jack pine budworm. Nebraska National Forest 1980. USDA For. Serv., Rocky Mt. Region Tech. Rpt. R2-25, 16 p.

James, R. L. 1979. Jack pine decline in the Nebraska National Forest: distribution, insect and fungal associates. USDA For. Serv., Rocky Mt. Region Bio. Eval. R2-79-4, 19 p.

Stewart, J. L. 1965. *Fomes annosus* found in Nebraska. Plant Dis. Reptr. 49:456.